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Local extinction of *Melanophryniscus montevidensis* (Anura: Bufonidae) in the Argentine Pampas

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Abstract
Melanophryniscus montevidensis inhabits sandy dunes along the Rio de la Plata shoreline and Atlantic coast in Uruguay and southern Brazil. Here we report 2 specimens from different localities at eastern Buenos Aires province, Argentina, that were collected prior to the 1970s. *Melanophryniscus montevidensis* probably inhabited patchy sand dune environments in Buenos Aires. It is possible that the disappearance of natural environments (including dunes) in the Argentine Pampas resulted in the local extinction of *M. montevidensis*, a species sensitive to habitat fragmentation and anthropic modifications.

Key words
Sand dunes; *Melanophryniscus montevidensis*; local extinction; Buenos Aires; Argentina.

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Introduction

Melanophryniscus is an endemic Neotropical bufonid genus composed of 29 species (Frost 2017) distributed in Brazil, Paraguay, Bolivia, Uruguay and Argentina (Cruz and Caramaschi 2003, Kwet et al. 2005, Di Bernardo et al. 2006, Peloso et al. 2012). In Argentina 12 species have been recorded, mainly distributed in forested areas in the northern half of the country, and in patches in the southern and central hills (Baldo and Krauczuk 1999, Céspedez et al. 2000, Prigioni and Langone 2000, Céspedez and Motte 2001, Céspedez and Motte 2007, Baldo 2001, Cabrera 2001, Caramaschi and Cruz 2002, Céspedez 2003, Céspedez 2008, Céspedez 2009, Baldo and Basso 2004, Agnolin and Bogan 2014).

Currently, the genus is represented by 3 phenotypic groups (Céspedez and Motte 2001, Cruz and Caramaschi 2003) that are poorly known with regard to specific content and most behavioral aspects (Céspedez et al. 2000). Most of the living species are included within the phenotypic group *M. stelzneri* (Prigioni and Langone 2000, Caramaschi and Cruz 2002, Céspedez 2008, Baldo and Basso 2004). *Melanophryniscus. montevidensis* belongs to the *M. stelzneri* group. It inhabits a narrow corridor of sandy dunes along the Rio de la Plata shoreline and Atlantic coast in Uruguay (Langone 1995, Núñez et al. 2004, Maneyro and Kwet 2008) and Alvorada (Barra do Chui) at the southern extreme of Rio Grande do Sul, Brazil (Tedros et al. 2001, Bernardo-Silva et al. 2012) (Fig. 1). A species informally known as *M.* aff. *montevidensis* is known from the Ventania and Tandilia Hill

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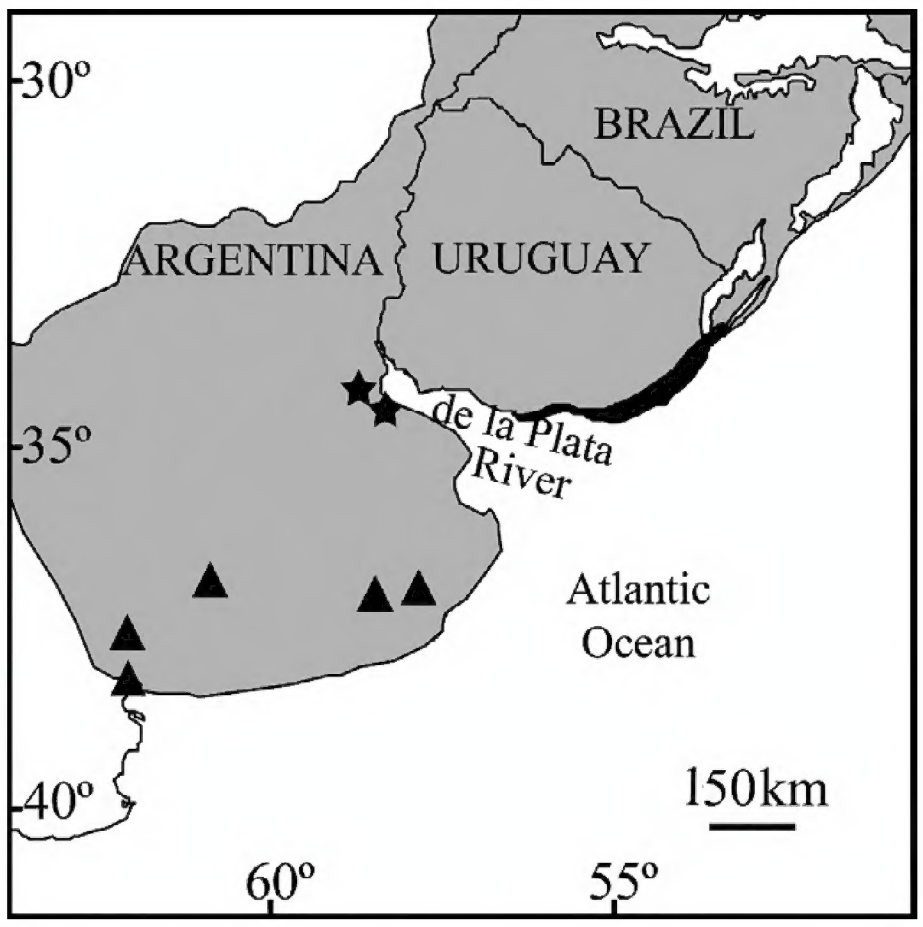
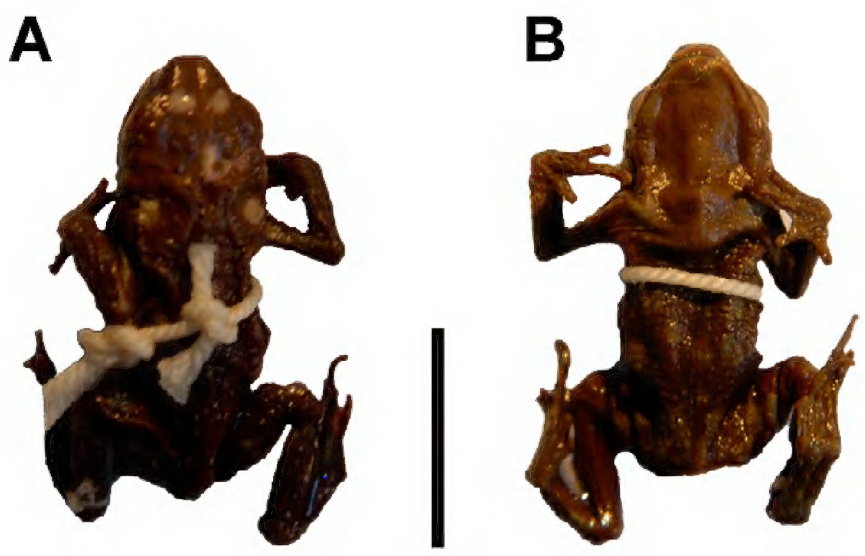


Figure 1. Map showing new locality records for *Melanophryniscus montevidensis*. Black shading indicates current distribution of the species (based on Zank et al. 2014), black triangles constitute Buenos Aires records of the species (see Vaira et al. 2012), and black stars include localities here reported.

systems and the South Coastal Dunes in Buenos Aires province, Argentina (Cairo et al. 2008, Cortelezzi et al. 2015, Friedman et al. 2016, Kacoliris et al. 2017). In older works these populations were assigned to the Uruguayan species *M. montevidensis* based on coloration similarities (Cei 1980, Gallardo 1987, Gallardo and Varela de Olmedo 1992), but Klappenbach and Langone (1992), based on geographical distribution, concluded that they could be different species, a hypothesis supported by Céspedez et al. (2000). These specimens are still under study; however, genetic information indicates that they belong to a single species (Vaira et al. 2012), a criterion that is followed here.

Because of its restricted geographical distribution, as well as the strong anthropic modifications of the area, the populations of *M. montevidensis* in South America are decreasing, and thus this species is treated as "Vulnerable" at the global level (Langone 2004).

Here we report 2 specimens of *Melanophryniscus montevidensis* from different locations in eastern Buenos Aires province, Argentina. These constitute one of the few available records for the country, and the only ones from the Eastern Argentine Pampas.



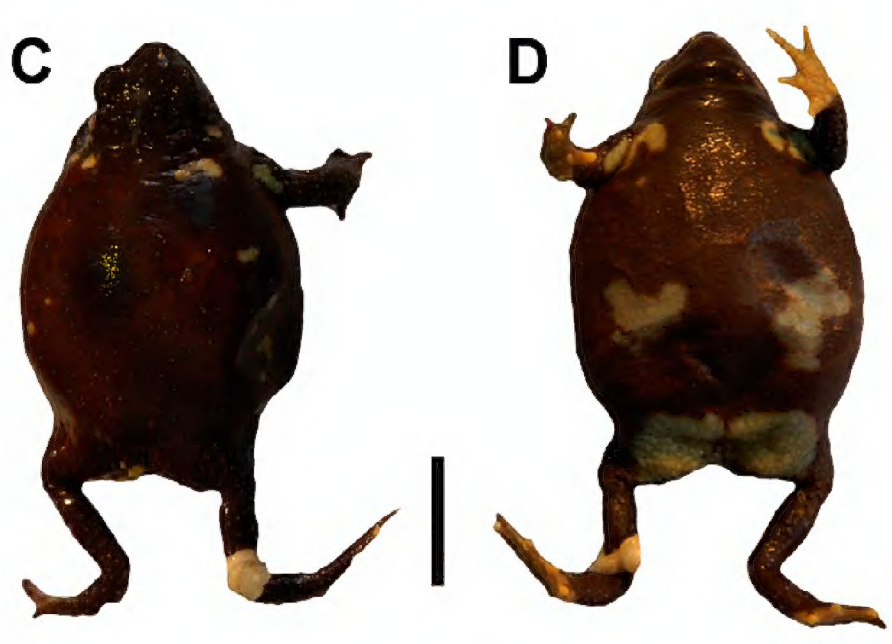


Figure 2. *Melanophryniscus montevidensis* reported here. **A, B.** MACN He 04513, dorsal and ventral views, respectively. **C, D.** MACN He 18139, dorsal and ventral views, respectively. Scale bar: 1 cm.

Methods

Specimens here reported are housed at the Colección Herpetología, Museo Argentino de Ciencias Naturales "Bernardino Rivadavia", Buenos Aires, Argentina (MACN He).

MACN He 04513 comes from Zelaya city, Pilar, Buenos Aires province, Argentina. It was collected by A.G. Freers in December 1924 (Fig. 2A, B).

MACN He 18139 comes from Banfield city, Lomas de Zamora, Buenos Aires province, Argentina. It was collected by Juan R. Deriu on 6 June 1963 (Fig. 2C, D).

There is a possibility that these 2 specimens of *Melanophryniscus montevidensis* may be mislabeled. However, it is unlikely that specimens collected at different times by different collectors, and coming from neighboring localities in northern Buenos Aires, represent 2 parallel and independent mistakes. Furthermore, the specimens have been labeled 3 times: one label is associated with the preserved specimen, and the other 2 labels are housed in different catalogues of the MACN-He collection, reinforcing the possibility that a label mistake for these individuals is unlikely.

Results

The specimens here reported exhibit a unique combination of characters that support identification as *M. montevidensis*: dorsal surface black, with pale lateral blotches, sparse blotches on the dorsal surface of head and shoulders, small scattered pale blotches ventrally and weakly granular dorsal skin. The presence of a large cream-colored patch along the posterior portion of the abdomen and the thigh indicates the presence of a wide red blotch in life (Langone 2002, Cruz and Caramaschi 2003, Maneyro and Kwet 2008). Furthermore, this combination of characters distinguishes *M. montevidensis* from other species of the genus (see Céspedez 2003, Céspedez 2008, Céspedez 2009, Céspedez and Motte 2001,

Céspedez and Motte 2007). In general aspect *M. atroluteus* is similar to *M. montevidensis* (Maneyro and Kwet 2008) but differs from the latter in lacking (or having only scattered) yellow blotches along the lateral surface of the body and dorsal surface of the head (Klappenbach and Langone 1992, Cruz and Caramaschi 2003, Maneyro and Kwet 2008). Furthermore, *M. atroluteus* exhibits notably rugose and spiny dorsal skin (Kwet et al. 2005, Maneyro and Kwet 2008).

Discussion

The anuran fauna of central Argentina (Buenos Aires and La Pampa provinces) shows a species composition similar to that of faunas from Uruguay and Rio Grande do Sul (Gallardo 1965, Maneyro et al. 1995). Among these, a particular group has been named as "Atlantic shore-fauna" (Maneyro et al. 1995, Maneyro and Carreira 2006). This includes sand-dune adapted amphibians such as *Melanophryniscus montevidensis*, among other taxa.

As indicated above, in the Ventania and Tandilia hill systems of southern Buenos Aires province there is a *M. montevidensis* population that is disjunct from the main distributional range of the species. In historical times this population was even more geographically widespread, as demonstrated by the finding of specimens among sand dunes near Bahía Blanca city by Charles Darwin (Bell 1843, Cabrera 2001). It is worthy to mention that recent reports are based on old museum specimens, and that the species has not been found in the last 100 years, in spite of fieldwork and sampling in the coastal dunes of the province (Kacoliris et al. 2017).

Currently, sand dunes, which are the most suitable habitat for *M. montevidensis*, are totally absent in the northern tip of Buenos Aires province. However, the presence of sand dune environments in northeastern Buenos Aires province can be inferred from old botanical collections that indicate the existence of plants associated with sand dunes in Ensenada and Punta Indio Districts (Hicken 1910, Parodi 1940). Parodi (1940) published photographs showing sand dunes in Monte Veloz (Punta Indio District). This locality has provided some rare zoological records, such as the only Solifugae known from northern Buenos Aires (Maury 1977), and the rodent *Necromys benefactus* (Galliari and Pardiñas 2000), both recorded there prior to 1950, in semiarid and open environments. Furthermore, specimen MACN He 04513 of *M. montevidensis* comes from Zelaya, a town that in the early 20th century yielded specimens of *Ctenomys talarum*, a rodent of open sandy environments that is extirpated from most of its original area (Agnolin and Lucero 2013). *Melanophryniscus montevidensis* was probably an inhabitant of those patchy sand dune environments.

The disappearance of undisturbed environments (including dunes) from part of the Argentine Pampas affected a large number of amphibians (Lavilla 2001). This probably resulted in the local extinction of *M. montevidensis*, a species sensitive to habitat fragmentation due to climatic change and anthropic modifications (Langone 1995, Langone 2003, Langone 2004; see also Zank et al. 2014). Uruguayan populations of *M. montevidensis* are considered as Endangered (Maneyro and Langone 2001, Carreira and Maneyro 2015), and several local populations from Montevideo and Canelones departments have been extirpated (Langone 2003). A probable cause for this decline is the urbanization and consequent habitat fragmentation along the Uruguayan coast (Langone 1995). It is expected that climatic change would affect negatively this species in the future (Toranza and Maneyro 2013, Toranza et al. 2016).

In summary, based on these data, we infer that in the past, *M. montevidensis* occurred in the eastern Buenos Aires Pampean grasslands, and became locally extinct by the mid 20th century, probably due to degradation of sandy soil habitats.

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Authors' Contributions

FLA and EG collected the data, wrote the text, and made the analysis.

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